

UNCLASSIFIED

DTIC FILE COPY

2

SECURITY CLASSIFICATION OF THIS PAGE

## REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified		1b. RESTRICTIVE MARKINGS													
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; Distribution unlimited													
2b. ( )															
4. PI <b>AD-A224 782</b>		5. MONITORING ORGANIZATION REPORT NUMBER(S) AD-A224 782													
6a. NAME OF PERFORMING ORGANIZATION		ICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION AFOSR/NP												
6c. ADDRESS (City, State and ZIP Code) University of California, Berkeley Space Sciences Laboratory Berkeley, California 94720		7b. ADDRESS (City, State and ZIP Code) Building 410 Bolling AFB, DC 20332-6448													
8a. NAME OF FUNDING/SPONSORING ORGANIZATION AFOSR	8b. OFFICE SYMBOL (If applicable) NP	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER AFOSR-85-0162													
8c. ADDRESS (City, State and ZIP Code) Building 410 Bolling AFB, DC 20332-6448		10. SOURCE OF FUNDING NOS. <table border="1"><tr><td>PROGRAM ELEMENT NO. 61102F</td><td>PROJECT NO. 2311</td><td>TASK NO. A1</td><td>WORK UNIT NO. N/A</td></tr></table>		PROGRAM ELEMENT NO. 61102F	PROJECT NO. 2311	TASK NO. A1	WORK UNIT NO. N/A								
PROGRAM ELEMENT NO. 61102F	PROJECT NO. 2311	TASK NO. A1	WORK UNIT NO. N/A												
11. TITLE (Include Security Classification) "COSMIC BACKGROUND RADIATION STUDY SMALL ANGULAR SCALE ANISOTROPY."		SUNYAEV-ZEL'DOVICH EFFECT AND													
12. PERSONAL AUTHOR(S) George F. Smoot															
13a. TYPE OF REPORT Final	13b. TIME COVERED FROM 85/02/01 TO 86/1/31	14. DATE OF REPORT (Yr., Mo., Day) 86/03/31	15. PAGE COUNT 1												
16. SUPPLEMENTARY NOTATION															
17. COSATI CODES <table border="1"><tr><td>FIELD</td><td>GROUP</td><td>SUB. GR.</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>		FIELD	GROUP	SUB. GR.										18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB. GR.													
19. ABSTRACT (Continue on reverse if necessary and identify by block number) A bolometer cooled by a He-3 refrigerator has been built to detect small anisotropies in the cosmic background radiation. This bolometer can be tested on ground-based instruments and is proposed to be eventually used on a shuttle-borne system.															
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS <input type="checkbox"/>		21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED													
22a. NAME OF RESPONSIBLE INDIVIDUAL Henry R. Radoski		22b. TELEPHONE NUMBER (Include Area Code) (202) 767-4906	22c. OFFICE SYMBOL NP												

DTIC  
ELECTE  
JUL 25 1990  
S B D

121

Final Technical Report, AFOSR  
Sunyaev-Zel'dovich Effect

Equipment Status as of March 31, 1986:

The liquid helium cryostat has been modified for use with dish antenna and Winston cone beam optics, and has been demonstrated to hold liquid helium with a maximum input heat leak of no more than 200 mW. Typical heat input was below 100 mW under normal operating conditions.

Plumbing has been installed on the cryostat to allow controlled pumpdown of liquid helium to near-vacuum condition. The pump and assorted plumbing was tested and demonstrated to work as planned; additional hardware will not be necessary to operate the cryostat at 1.5 K.

A low-noise x1000 preamp has been built and tested. The input consists of a cooled JFET operating within the helium cryostat, approximately one inch from the bolometer. The JFET self-heats to its operating temperature of 77 K.

Two bolometers (obtained from Harvey Moseley at Goddard Space Flight Center) have been installed and tested at 4 K. The Noise Equivalent Power (NEP) of each was determined.

Bolometer #1: NEP =  $1 \times 10^{-13} \text{ W Hz}^{-1/2}$

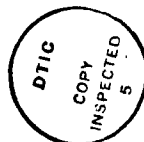
Bolometer #2: NEP =  $8 \times 10^{-14} \text{ W Hz}^{-1/2}$

A lowpass capacitive-mesh microwave filter was built to our specifications at the UCB Microfabrication Facility and installed in the cryostat. Nominal passband:  $f < 115 \text{ GHz}$ . Funding was discontinued as testing of the filter was beginning.

The entire system (bolometer, filter, optics, cryostat, and assorted electronics) have been assembled into a single-channel detector with 0.5 degree beamwidth and a nominal passband of 80-115 GHz. Funding was discontinued before the integrated system could undergo full laboratory testing (cold/ambient targets) and astronomical testing (moon/planets). The system was demonstrably non-microphonic and had noise within a factor of two of the Johnson limit.

At the end of the funding, the equipment was stored in operational condition. The equipment will be kept intact for a reasonable period. The cryostat may eventually be used for another experiment.

<b>Accession For</b>	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR)  
OFFICE OF TRANSMITTAL TO DTIC  
This technical report has been reviewed and is  
approved for public release IAW AFR 190-12.  
Distribution is unlimited.  
MATTHEW J. KETTER  
Chief, Technical Information Division